AP Statistics
Test: Describing Data
Instructor's Version

Free Response: 3 questions, 52 points, 30 minutes

1. Lord Raleigh studied the density of nitrogen and conjectured that nitrogen produced from chemical compounds tended to be lower than the densities of nitrogen produced from the air. His measurements were as follows:

Chemical	Atmospheric
2.30143	2.31017
2.29890	2.30986
2.29816	2.31010
2.30182	2.31001
2.29869	2.31024
2.29940	2.31010
2.29849	2.31028
2.29889	2.31163
2.30074	2.30956
2.30054	

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A. Calculate the summary statistics for each set of data (mean, standard deviation, five-number summary) (12 points)

Answers:
x-bar (chemical) = 2.299706
s(chemical) = .001313
5-no. summary (chemical) = 2.29816, 2.29869, 2.29915, 2.30074, 2.30182

x-bar (atmospheric) = 2.3102167
s(atmospheric)=.00057365x 10^{-4}
5-no. summary (atmospheric) = 2.30956, 2.309935, 2.3101, 2. 2.31026, 2.31163

Scoring: 12 points (-2 for each incorrect answer down to zero. No need to show work on this problem; it can be done strictly on the TI.)

B. What is the interquartile range of each data set? Identify the interval of values that defines the IQR. (6 points)

Answers:
chemical: (2.29869, 2.30074), IQR = .00205
atmospheric: (2.309935, 2.31026), IQR = .000325 = 3.25 x 10^{-4}

Scoring: 6 points (2 points for each correct IQR; 1 point for showing how IQR was computed for at least one of the data sets)

C. Do the samples appear to be from the same population? Why or why not? Support your answer with numerical facts and convincing reasons and explanations. (8 points)

Answer:
The regions that define the IQRs for the two samples do not overlap at all. That is, the lower quartile for the atmospheric data is actually above the upper quartile for the chemical data. This would be highly unlikely if the two samples were from the same population. It appears that Raleigh was correct in his conjecture.

Scoring
8 points. Score holistically any complete explanation that follows reasonably from the student's response to part B. Think in terms of the following scale:
8 points: Complete and accurate response
6 points: Accurate, but not complete (partially complete)
2 points: Incomplete or inaccurate response; some hint of correctness
0 points: Completely inaccurate response

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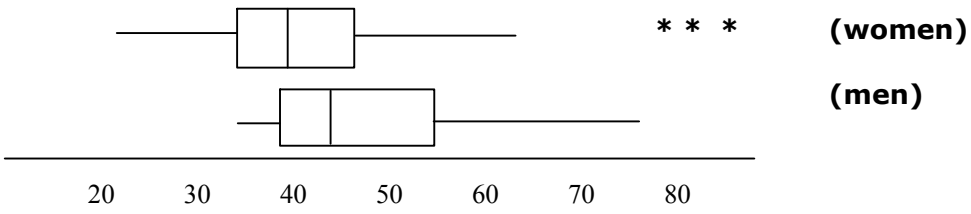
2. The ages of the Oscar-winners for best actor and actress for the years 1970 through 1990 are given below:
Women: 34, 34,26,37,42,41,35,31,41,33,30,74,33,49,38,61,21,41,26,80,72
Men: 43, 40,48,48,56,38,60,32,40,42,37,76,39,55,45,35,61,33,51,32,42

Use what you have learned in this Unit to discuss apparent difference in the ages of Oscar-winning men and women. Use both a numerical and graphical argument. (26 points)

Answers:
The mean age of female winners was 41.86 with s = 16.4. The mean age for male winners was 45.38 with s = 11.2 . There are three outliers with the women: 72, 74, 80. Without those, the mean for the women drops to 36.3. It appears that women are, on average, younger than men when they win an academy award. This answer can be backed up by showing comparative box plots or back-to-back stem-and-leaf Plots.

Box Plot



Stem and Leaf Plot

Women		**Men**
661	2	
875443310	3	2235789
92111	4	00223588
	5	156
1	6	01
42	7	6
	0	8

Scoring:
- (2 points for each correct mean and standard deviation. No work need be shown) (8 points total for this element)
- Up to 8 points for an accurate graphical analysis of the data. Could be either one of the above graphics or some other correct graph.
- Up to 10 points for accurately interpreting the data: women are typically younger than men when they win the academy award. (7 points max here if no concept of variability—not all women are younger than all men. Think of the 10 points as representing a Complete Response, Substantial Response, Developing Response, and Minimal Response.)

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